CLAIMS

1. Discrete step rotary actuator (1), comprising a stationary part or stator (2), a rotary part or rotor (3) and means (10, 13, 14) for rotating the rotor (3) with respect to the stator (2), characterized in that said means (10, 13, 14) comprise

- at least an actuating element (10) made at least partly with a shape memory active material, which can take a shortened configuration and an extended configuration, the actuating element (10) having a first portion (11) anchored to one of said stator (2) and rotor (3),

- a sequence of seatings (14) arranged as a circumference around the other one of said rotor (3) and stator (2), the actuating element (10) having a second portion (12) that can engage said seatings (14) sequentially,

- elastic means (13) placed between the actuating element (10) and the one of said stator (2) and rotor (3) to which said first portion (11) of the actuating element (10) is anchored,

where said elastic means (13) are operative for inducing a shift of said second portion (12) of the actuating element (10) between two consecutive seatings (14) of said sequence, during the passage of the active material from its shortened to its extended configuration, the passage of the active material from the extended configuration to its shortened configuration imparting the rotor (3) a rotation couple with respect to the stator (2).

2. Actuator according to claim 1, characterized in that said active material is selected in the group consisting of shape memory metal alloys, shape memory polymers, electro-active polymers.

3. Actuator according to claim 1 or 2, characterized in that said actuating element (10) can be subject to an electric or heat stimulus so as to obtain its passage from its shortened to its extended configuration, or vice-versa.

4. Actuator according to claim 3, characterized in that said actuating element (10) is connected to electric supply means (AE), which are operative for heating it by Joule effect.

5. Actuator according to claim 3, characterized in that said actuating element (10) is arranged so as to be actuated by the temperature of a fluid to which said element is subject.

6. Actuator according to claim 1, characterized in that said elastic means (13) are operative to induce exert a traction onto the respective actuating element (10), in order to move said second portion (12) away from said first portion (11).

7. Actuator according to claim 6, characterized in that said elastic means comprise a spring (13), in particular a coil spring.

8. Actuator according to claim 7, characterized in that said second portion comprises a terminal element (12) with which an end of said spring (13) is associated.

9. Actuator according to claim 1, characterized in that said seatings (14) have a substantially concave shape, whose cavity is open in the direction opposite the direction of angular movement (F) of said rotor (3).

10. Actuator according to claim 1, characterized in that said seatings (14) are substantially at the same distance one from the other and are arranged on a circumferential surface of one of said stator (2) and rotor (3).

11. Actuator according to claim 10, characterized in that said circumferential surface is shaped so as to define, between pairs of subsequent seatings (14) of said sequence, a slope (15) with a descending development with respect to the direction of angular movement (F) of said rotor (3).

12. Actuator according to claim 8, characterized in that said actuating element (10) has a thin and long shape.

13. Actuator according to claim 1, characterized in that said stator (2) and rotor (3) are made up each of a pair of substantially disc-shaped, coaxial and parallel elements (2', 3'), said actuating element (10) and the respective elastic means (13) extending at least partly in a space defined between the two disc-shaped elements (2', 3') of each pair.

14. Actuator according to claim 1, characterized in that it is provided for a plurality of actuating elements (10), each of which is associated with respective elastic means (13).

15. Actuator according to claim 14, characterized in that it is provided for a simultaneous electric supply of a plurality of said actuating elements (10).

16. Actuator according to claim 14, characterized in that said actuating elements (10) are supplied with electric energy in a sequential way.

17. Actuator according to claim 14, characterized in that at least a first plurality of said actuating elements (10) is supplied sequentially with respect to a second plurality of said actuating elements (10).

18. Actuator according to claim 1, characterized in that said stator (2) is in a peripheral position with respect to said rotor (3).

19. Actuator according to claim 1, characterized in that said rotor is in a peripheral position with re-

spect to said stator.

20. Actuator according to claim 10, characterized in that said circumferential surface is an inner or outer peripheral surface of said stator (2) or rotor (3).

21. Use of a discrete step rotary actuator (1) made in accordance with one or more of the preceding claims, for manufacturing miniaturized devices such as motors pumps, turbines, shutters, flow deflectors.

22. Actuating device capable of generating actuations in two opposite directions of rotation, comprising a first and a second discrete step rotary actuator (1) made in accordance with one or more of the claims 1 to 20, the rotors (3) of the two actuators (1) moving angularly in opposite directions.

23. Method for generating a discrete step rotation of a stationary part or stator (2) with respect to a rotary part or rotor (3), comprising the following steps:

- providing out at least an actuating element (10) at least partly made of a shape memory active material, which can take a shortened and an extended configuration;

- making a sequence of seatings (14) arranged on of said stator (2) or rotor (3);

- anchoring a first portion (11) of the actuating element (10) to one of said rotor (3) and stator (2), so that a second portion (12) of the actuating element (10) engages a first of said seatings (14);

- placing elastic means (13) between the actuating element (10) and the one of said stator (2) or rotor (3) to which the first portion (811) of the actuating element (10) is anchored;

- applying an electric or heat stimulus to the active material, so as to determine the passage from said

shortened to said extended configuration, or vice-versa;

where the passage of the active material from its extended to its shortened configuration imparts the rotor (3) a rotation couple with respect to the stator (2) contrasting the action of said elastic means (13), and the latter induce a shift of said second portion (12) from said first seating to a following seating (14) of said sequence, during the passage of the active material from said shortened to said extended configuration.